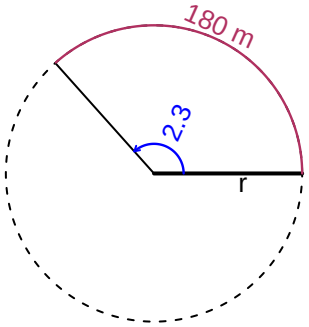
Name: Date:

Trig Final (Solution v40)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.3 radians. The arc length is 180 meters. How long is the radius in meters?

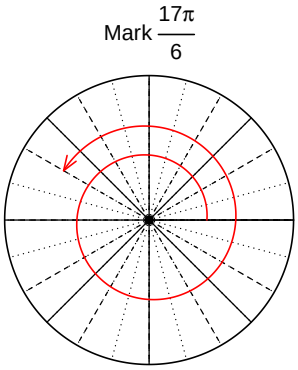


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

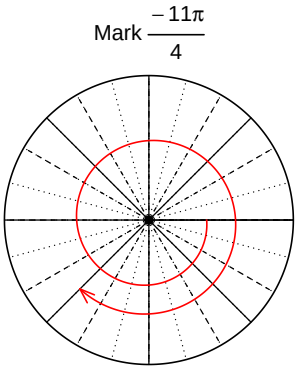
$r = 78.26$ meters.

Question 2

Consider angles $\frac{17\pi}{6}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{17\pi}{6}\right)$ and $\cos\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(17\pi/6)$



Find $\cos(-11\pi/4)$

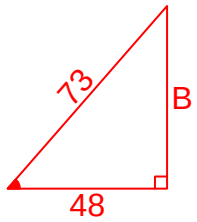
$\sin(17\pi/6) = \frac{1}{2}$

$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-48}{73}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

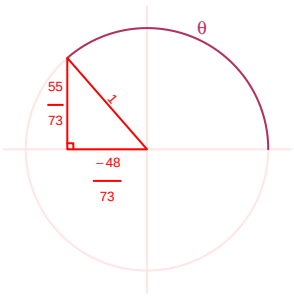
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$48^2 + B^2 = 73^2$$
$$B = \sqrt{73^2 - 48^2}$$
$$B = 55$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{55}{73}}{\frac{-48}{73}} = \frac{-55}{48}$$

Question 4

A mass-spring system oscillates vertically with a frequency of 8.76 Hz, an amplitude of 5.86 meters, and a midline at $y = -6.93$ meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 5.86\sin(2\pi 8.76t) - 6.93$$

or

$$y = 5.86\sin(17.52\pi t) - 6.93$$

or

$$y = 5.86\sin(55.04t) - 6.93$$